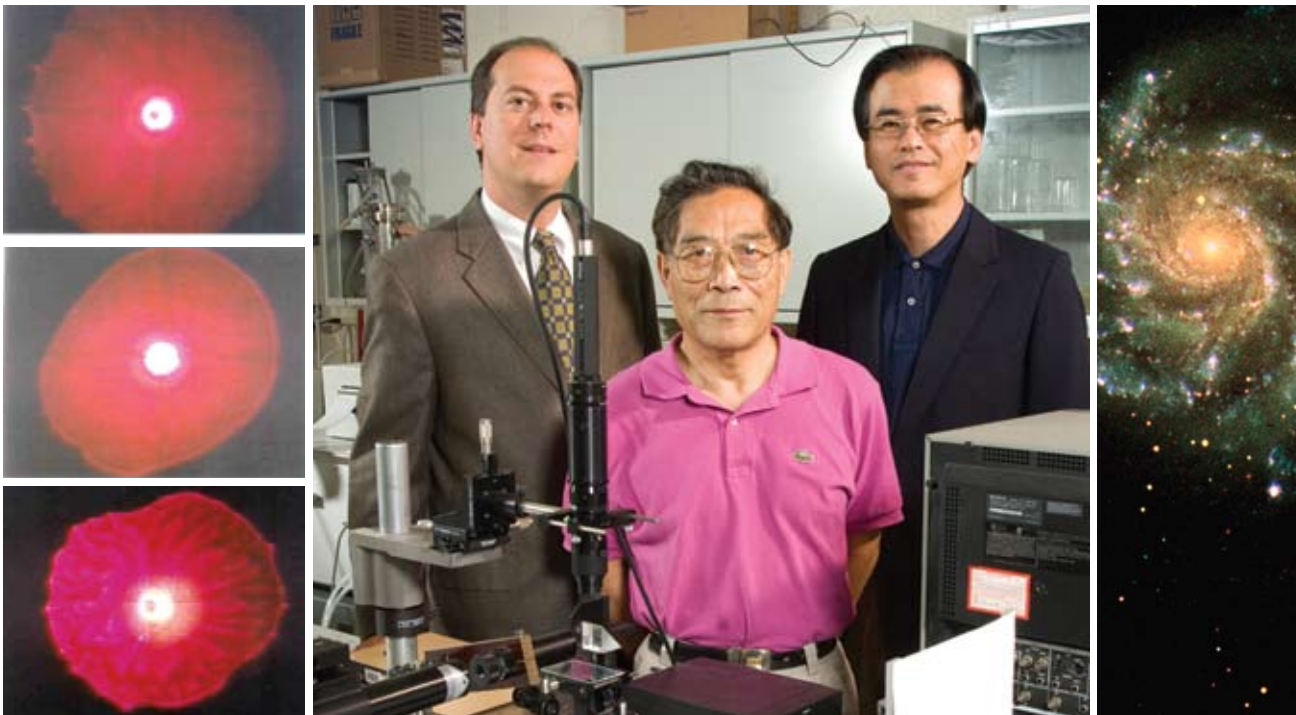




technology opportunity

Device for Instantly Measuring Contact Angles of a Liquid on a Solid Surface



The Multidimensional Contact Angle Measurement Device (MCAMD) instantly measures the contact angles of a liquid on a solid surface, revealing critical information on wetting and spreading characteristics of liquids. This measuring technique shows that evaporation and thermocapillary convection greatly affect the spreading process. Not only can the MCAMD measure the instant contact angles and the rate, direction, and other characteristics of liquid spreading, it can visualize flow phenomena without needing microparticle tracers. The technology can be used to improve the performance of paints, adhesives, and lubricants, as well as boiling heat transfer processes.

Benefits

- **Comprehensive.** The MCAMD can provide a 360-degree view of the liquid spreading process, rather than only the side view provided by devices now on the market.
- **Exhaustive.** The MCAMD measures angles and other spreading characteristics of stable and unstable droplets on a variety of substrates, including non-isotropic and non-isothermal solid surfaces.
- **Cost-effective.** The MCAMD costs up to 15 times less than currently available, less-capable measuring devices.
- **Accurate.** Because the device takes into account evaporation and capillary convection flow, the measurements are more accurate than devices currently on the market.

Applications

Comprehensively measures the spreading parameters of common liquids on:

- Transparent and aluminized non-transparent solid surfaces
- Isotropic and non-isotropic solid surfaces
- Isothermal and non-isothermal solid surfaces
- Tilted solid surfaces

Technology Details

Understanding the properties of interaction between liquids and different surfaces is critical to the production and performance of many commercial coatings, lubricants, and industrial processes, such as film cooling, biological cell adhesion, and boiling heat transfer. The MCAMD's space-based applications include heat pipes and fuel tanks.

How It Works

The MCAMD provides a unique method of simultaneously measuring the instant local contact angles of a liquid drop on a solid surface in the perimeter of the drop and sensitively chronicling the capillary flow inside the drop. Thus, the effects of the capillary flow induced by the evaporation on the spreading and contact angles of the liquid on the solid surface can be quantitatively estimated.

The optical system consists of a helium-neon laser, a collimator, two beamsplitters, two video recording systems, a test plate (an aluminized glass plate), and a screen. The optical system can be easily simplified for measuring on transparent substrates. The reflection-refracted shadowgraphy image on the screen and the top-view photography are used to measure the spreading and instant dynamic contact angle of a droplet on the non-transparent substrate. The top view and far-field caustic image on the screen, created by the drop-refracted laser beam, are monitored by video recorders. The parameters of spreading rate, instant contact angles, and drop profiles are calculated using several simple equations.

Why It Is Better

Countless projects and industries require a thorough understanding of the wetting and spreading properties of a liquid on a solid surface. Those properties are governed by the instantaneous contact angles around the periphery of a liquid drop on a solid substrate. Commercially available contact angle meters are able to measure the angle only from a one-side view and cannot be used to investigate the wetting and spreading characteristics affected by evaporation and capillary flows inside the liquid.

The MCAMD measures the spreading parameters, including instant local contact angles, contact diameters, drop foot heights, identification of profile mode, and capillary flow pattern. The effects of capillary flow and evaporation on the spreading can be estimated accurately. The MCAMD is also easy to use.

Licensing and Partnering Opportunities

NASA invites companies to discuss licensing or partnerships opportunities involving this innovative measurement technology for commercial applications.

For More Information

For more information about this and other technology licensing opportunities, please visit:

Technology Transfer and Partnership Office

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